Finally, existing PSTN interoffice facility routes and fiber cables, and some elements of the electronics and management systems, can be used for broadband interoffice transport.[6] The primary difference will be that whereas the transmitted signals in the PSTN are "channelized" into 64 kbps for voice communications, the broadband signals are not channelized, or at least are channelized into much higher bit rate signals.

For CLECs, the situation is considerably different. They do not have extensive PSTN facilities – existing loop cables and routes, FDI locations, ubiquitously-deployed COs, extensive interoffice cables and routes, and centralized tandem switching locations – and what they do have is typically concentrated on particular parts of the PSTN. Thus, whether they are preparing to offer narrowband or broadband services, they are starting from scratch relative to the ILECs.

B. Broadband Markets

Another way to approach broadband communications, one that perhaps makes more apparent the reason for the current intense interest in the subject, is to consider applications to which broadband networks are being put, and to discuss the revenues and current growth rates of those applications. We start by considering several broad classifications of broadband communications users, and the uses to which they put broadband, as seen in the following table:

[6] A commonly-envisioned scheme is that non-channelized broadband signals may be transmitted over the same fibers as the existing channelized signals needed in the PSTN through the use of wave division multiplexing, which adds new wavelengths or "colors" to the transmitted signal.

USERS	APPLICATIONS
Carriers and other service providers	underlying transport for public data network offerings
Large corporations	corporate data networks, including intranets and extranets; video and multi-media conferencing; and broadband internet access
Remote offices of large companies	access to corporate data networks; video and multi-media conferencing ; broadband internet access
Residential	access to corporate data networks for telecommuters;
	video and multi-media conferencing for telecommuters;
	Broadband internet access;
	Entertainment video; and
	networked games and other applications

Table II-1: Broadband Users And Their Applications

Note that this list omits the use of broadband communications purely as a means of carrying multiple voice circuits, for the reasons mentioned previously in connection with dedicated broadband circuits – such a use is both long-standing and not of particular interest in discussing broadband services. Thus, for instance, we do not include voice networks under either carriers/service providers or large corporations.

Two terms in Table II-1, "intranets" and "extranets," warrant definition because they are relative newcomers to the industry vernacular. As the internet grew in popularity, large corporations came to recognize the potential of internet protocols, particularly standard internet applications such as the Simple Mail Transfer Protocol, File Transfer Protocol, Telnet (remote terminal log-on) and World Wide Web, as a replacement for, or enhancement to, their legacy data communications networks. This recognition was boosted by the growing adoption of the client-server computing paradigm, with its emphasis on distributed processing, as a replacement for the traditional host-centric terminal-mainframe paradigm. As a result, during the middle part of the 1990's, the use of the internet protocol suite, including its standard applications, in

corporate data networks came into vogue. The industry coined the term "intranet" for such an internet-based corporate network; the year 1996 was designated in marketing hype as the "year of the intranet." On the heels of that development has come the realization that companies are increasingly linking their networks in order to provide new tools for doing business with each other, such as Electronic Data Interchange and other forms of electronic transactions, joint video and multi-media conferencing, and the like. Again, the internet protocol suite has become a popular choice for such multi-corporate networks due to its relative simplicity, widespread deployment, and versatile support of distributed processing. The industry has coined the term "extranet" for such internet-based multi-company networks, and 1998 is often referred to in marketing hype as the "year of the extranet."

One other internet concept, the virtual private network ("VPN"), is growing in importance.[7] While corporate intranet and extranet networks have traditionally been private in nature – based on company-owned internet routers linked by dedicated circuits – the concept of a VPN is that such a network can be implemented on a public internet while still providing appropriate functionality and quality of service guarantees to the corporate user. A key consideration, one that originally acted as an impediment to such networks but is now widely viewed as amenable to solution, is the need to guarantee the security of the data on the VPN. This is done through the use of router "firewalls" that ostensibly act to prevent the unintended flow of data between the VPN and the rest of the public network.

[7] The term VPN did not originate with the internet, but with the provision of seemingly-dedicated corporate voice networks over the PSTN Network, with network processors – the intelligent network – used to provide corporate customers with the features and quality of service for which they had contracted even while using public network facilities.

Another way to view Table II-1 is in terms of the broadband communications requirements capabilities it suggests:

- Broadband access links to remote offices of large corporations, to small businesses, and to high-end residential users;[8]
- Fast packet switching for access to the internet, corporate data networks, video entertainment services, and other broadband services;
- Broadband backbone networks used in corporate data networks and the internet; and
- Networked applications.

The first three of these are no more or less than the components of the broadband network listed previously; what we have now done is identify the marketplace motivation for the broadband network. The fourth, however, is a new and not yet certain twist on the deployment of broadband services. It envisions that broadband service providers will increasingly site computers within their networks, rather than only at the periphery, and use those computers to offer broadband applications. The motivation for this development is that pure broadband transport will increasingly become a low-cost, low-differentiation commodity service, as the cost of fiber optics and fast packet switching decreases. Even today, few ISPs are strictly in the transport business; rather, they increasingly offer such applications as hosting of non-internet PCs, electronic mail, fax servers, and web site hosting. Likewise, in the video arena, today's cable companies are not in the information transport business per se, but are content providers. In the future, such involvement in the applications and content related to broadband transport will become a marketplace mandate.

It is quite common to observe pundits speaking or writing of the "stupid network," by which they mean to imply that the switches and routers in the broadband network provide only

basic, easy-to-implement functions. This is presented as one reason why the per-port cost of a router is often claimed to be significantly less than that of a conventional voice switch. We do not necessarily disagree with this argument from a technical perspective. However, based on our argument about the motivation to add value to the underlying commodity transport, the claim is unlikely to describe what businesses will attempt to do in broadband communications arena.

The likelihood that transport providers will add network applications, and that transport and applications processing may merge in the future broadband industry further demonstrates the need for adequate competitive safeguards to be imposed on the ILECs. At first glance, this might seem contradictory – it appears to be saying that all broadband providers will be capable of providing both transport and content, creating a commodity supply situation and obviating competitive safeguards. However, broadband backbone networks will likely become commodity-like well before broadband access. As a result, for the foreseeable future, broadband access will be critically dependent on underlying ILEC transport facilities and plant, access to ILEC operations support systems, collocation in ILEC central offices, and in some cases use of ILEC interoffice transport facilities. Thus, the competitive safeguards the FCC is considering must withstand ILEC pressure due not only to their interest in the transport business, but in the applications business as well.

C. Growth in Broadband Services

There is no question that the demand for broadband services is robust and growing. The Internet is, of course, the source of this demand. The World Wide Web and the seamless data

[8] It goes without saying that even higher capacity access to the primary locations of large corporations is also required, but such access is well-established and interesting only because of its ever-growing bandwidth requirements.

interchange over e-mail made possible by the Internet is literally changing the way business is conducted and the way consumers shop and consume. These changes are affecting provisioning, manufacturing, marketing, sales and delivery in virtually every company. The major constraint on this growth, at present, is the last mile or the link between businesses and the vast majority of consumers who cannot afford the high prices charged by ILECs for dedicated broadband pipes. This Section documents the growth of broadband and explains the role various segments of the industry are playing in its development.

1. The Internet

The spectacular success of the internet is well-known and need not be detailed at great length here. Due largely to the growth of the Internet, data Traffic is growing 30-40 percent per year, vs. 5 percent for voice. Traffic on the internet doubles every 100 days; the number of hosts doubles in less than a year; more than one third of Americans over 16 use the internet; and 75 percent of firms have internet access. Electronic commerce on the internet is projected to grow from a few billion at present to more than $300 billion in 2002;[9] by 2003, 65 percent of households will be on-line, and nearly 60 percent of all firms will subscribe to broadband services.[10]

2. Broadband Providers

Broadband providers can be classified into four groups. First, are the ISPs which provide gateways to the Internet for consumers, and which provide internet applications that are attractive

[9] Computer World Web Site, http://www.computerworld.com, viewed September 23, 1998; see also Colorado ISDN Users Group News, May 1998.
[10] The Strategis Group, Inc., "US Competitive Local Markets," 1998. ("Strategis Group")

to consumers, such as hosting PCs that do not have their own dedicated access to the internet,[11] email servers, and world wide web sites . Second, are the long haul transport companies such as AT&T, MCI Worldcom, Qwest, etc. Third are the CLECs – firms providing broadband services in competition with the fourth group – the ILECs.

All four segments of the industry are exhibiting healthy growth. Long haul providers and ISPs are investing billions of dollars in broadband, largely free from the need for government oversight or special government favors. These firms must invest to compete, and because of the safeguards in the '96 Act and the prior safeguards in the Modification of Final Judgement ("MFJ") have developed free from direct interference by the monopoly incumbent local exchange carriers. The focus in the remainder of the Section will be on CLECs and ILECs.

CLECs are growing rapidly as a result of the substantial infrastructure investments they have been making. CLEC investments have totaled nearly $11 billion.[12] Most of that investment is in the fiber that makes broadband available to large businesses in central business districts. CLECs are also interested in providing broadband capability to smaller businesses, using resold loops and xDSL technology. Cable television companies are also becoming CLECs, as they develop and deploy cable modem service. At present, those services are embryonic, at best – less than one million households actually subscribe to cable modem services.[13]

From 1994-1997, total telecommunications revenues increased by more than 8 percent per year, versus. less than 5 percent in previous decade, largely due to the broadband growth.[14]

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[11] For instance, the ISP provides PCs with temporary internet addresses when they log on, because the PCs are not assigned their own permanent addresses.

[12] Strategis Group

[13] Cable Television Industry Overview, "Delivering New Cable Products and Services" http://www.ncta.com/overview98, viewed September 23, 1998.

[14] Strategis Group

Although CLECs are growing at a rapid rate in percentage terms, the ILECs account for the bulk of the growth in absolute terms.[15] Much of this is due to the demand for second lines to accommodate residential demand for access to data services, including the Internet.[16] The ILECs are themselves becoming broadband suppliers through aggressive deployment of xDSL services.

D. Why Is Public Policy Critical?

Public policy related to the deployment of broadband services is critical to the future development of broadband services. As Sections III and IV describe, broadband investment will most likely be optimized in a competitive environment, free from monopoly abuse. ISPs, long haul transport providers, and CLECs all depend to one degree or another on the ILECs for access customers. Without appropriate competitive safeguards, there is a substantial risk that broadband capability will become the next generation bottleneck, with consequent negative implications for the growth and development of broadband services. Broadband, particularly to mass marketplace, is new, and has a number of technical difficulties. As we will see later, these include new opportunities for ILECs to discriminate against competitors.

III. THE COMMISSION'S BROADBAND INNOVATION MODEL

The Commission's proposal for stimulating broadband deployment was developed in response to ILEC requests for deregulation of broadband services and the ALTS Petition asking for improved access to critical ILEC bottleneck facilities.[17] The

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[15] See Section IV.A.

[16] Merril Lynch, "Telecom Services – Local," September 10, 1998.

[17] Petition of Bell Atlantic Corporation for Relief from Barriers to Deployment of Advanced Telecommunications Services, CC Docket No. 98-11 (filed Jan. 26, 1998); Petition of U S WEST Communications, Inc., for Relief from Barriers to Deployment of Advanced Telecommunications Services, CC Docket No. 98-26 (filed Feb. 25, 1998); Petition of Ameritech Corporation to Remove Barriers to

ILECs maintain that various types of deregulation are required to justify the investments needed for widespread deployment of broadband services. The ILEC's essentially argue that regulation will have two negative consequences for broadband deployment. First, capping the returns on new and innovative services will discourage investment in inherently risky new services. Second, application of the pro-competitive measures adopted by Congress in the '96 Act will further serve to discourage investment. That is, the ILECs claim that if they must unbundle the facilities used to provide new services and make them available to competitors at cost, or if the services must be made available for resale, investment will be discouraged.[18]

The Commission agrees that it is important to encourage investment in these new services, but not at the sacrifice of the pro-competitive measures contained in the '96 Act. The Commission's proposed response is to allow ILECs to provide broadband services free from regulation on the condition that the services are provided through a fully separated subsidiary. The underlying theory is that the fully separated subsidiary will provide incentives for the ILECs' regulated operations to make certain essential components of evolving local broadband networks available to all competitors on reasonable terms. In addition, the Commission is requiring the ILECs to make enhanced collocation opportunities available for competitors. With these safeguards in place, the

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Investment in Advanced Telecommunications Capability, CC Docket No. 98-32 (filed Mar. 5, 1998); Southwestern Bell Telephone Company, Pacific Bell, and Nevada Bell Petition for Relief from Regulation Pursuant to Section 706 of the Telecommunications Act of 1996 and 47 U.S.C. § 160 for ADSL Infrastructure and Service, CC Docket No. 98-91 (filed June 9, 1998). Petition of the Association for Local Telecommunications Services (ALTS) for a Declaratory Ruling Establishing Conditions Necessary to Promote Deployment of Advanced Telecommunications Capability Under Section 706 of the Telecommunications Act of 1996, CC Docket No. 98-78 (filed May 27, 1998) ("ALTS Petition").

[18] See Robert W. Crandall and Charles L. Jackson, Eliminating Barriers to DSL Service, July 1998.

ILEC subsidiary will be allowed to operate free from regulatory constraints. The Commission believes that, with these reforms, both the pro-competitive objectives of the 1996 Act and the public interest in investment in new services will be served.

There are six essential components of the regulatory paradigm contained in the Commission's proposal:

1. The local exchange business is a monopoly and is likely to remain so for the foreseeable future. If this were not the case, the Commission would be economically justified in deregulating without requiring a separate subsidiary. The fact is that even though technologies such as xDSL that are used to provide broadband services are relatively new, the critical "last mile" link to the customer remains an ILEC monopoly. Furthermore, the ubiquitous presence of the ILECs provides them a tremendous advantage over any potential competitor in deploying broadband.

2. Competition is the preferred vehicle for introducing new broadband technology into telecommunications markets. The Commission believes that competition will stimulate investment in broadband services. The assumption is that multiple firms will provide a variety of innovative approaches and additional capital in order to meet the consumer demand for broadband services. As demonstrated in Section II, this is already occurring. An alternative view of the world, implicit in the ILEC 706 Petitions, is that monopoly and not competition will lead to more innovation.

3. Competitive provision of broadband services requires that competitors have non-discriminatory access to essential elements of ILEC networks. If there is to be competition in the supply of broadband services to consumers, then competitors must have access to ILEC monopoly networks. The Commission's assumption is that separate

subsidiaries make non-discriminatory access to monopoly facilities more readily available, which will enable innovation in and deployment of broadband services by both the ILEC and other potential providers of broadband service. The Commission also recognizes the need to strengthen its local interconnection requirements to make collocation and access to unbundled network elements more readily available to competitors. In short, widespread broadband competition requires that all of the potential competitors have access to customers.

4. Reasonable regulation will not deter ILEC innovation. The Commission believes that a separate subsidiary structure will be conducive to ILEC deployment of broadband services. Alternatively, if the ILECs choose not to use a separate subsidiary structure and its broadband services are subject to full regulation, the Commission is implicitly assuming that the necessary broadband facilities will be deployed by the ILECs anyway.

5. Given the proposed competitive safeguards, the services provided by the ILEC separate subsidiaries can be safely deregulated. In theory, the subsidiaries will provide broadband services under the same circumstances as any other unaffiliated broadband competitor and therefore can be treated like any other competitor. A critical corollary is that competitors will have competitively neutral access to the underlying facilities they need.

6. The benefits of separate subsidiaries exceed any costs. It is possible that separate subsidiaries may impose operational costs on the ILECs. In this case, the implicit Commission assumption is that these costs will be outweighed by the competitive opportunities created by the plan. It is possible, of course, that the costs of separate subsidiaries are *de minimus*.

The Commission's model is, of course, internally consistent. Whether the intended consequences will follow from its application depends critically on how it is implemented and enforced. If the Commission's plan does not result in the competitive provision of broadband services, the results will be negative for consumers. Prices will be higher, product variety limited, and rate of innovation lower compared to competitive supply of new services. As a result, ILEC speed to market would not meet the Administration's year 2000 goals and objectives.[19] If consumers must wait for the uncertain prospects of cable television and wireless innovation, or for CLECs to expand based on current unbundled elements, the social costs could be substantial.

The conditions necessary to make the Commission broadband model work are discussed in the following Section.

IV. CONDITIONS NECESSARY TO VALIDATE THE COMMISSION MODEL

This Section addresses in detail each of the elements of the Commission's broadband innovation model described in Section III. The conclusion reached is that the Commission's approach will work better than the alternatives to promote the competitive deployment of broadband services, provided that the competitive safeguards are sufficiently strong, and that they are actually enforced. This is precisely why ILECs may choose not to adopt the optional separate subsidiary approach suggested by the Commission. Therefore, this Section also describes the strengthened safeguards needed whether or not the ILECs choose to integrate their broadband technology in the regulated network.

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[19] See http://www.whitehouse.gov/Initiatives/Millenium

A. The Local Exchange Is a Monopoly

If the local exchange market were already competitive, or could be expected with reasonable certainty to become competitive in the near term, there would be no economic objection to deregulation of ILEC broadband services. Although the ILECs have been predicting that local competition is "just around the corner" for more than a decade, the reality is quite different. Although CLECs are investing substantial sums of money and progress is being made, the unrealistic expectations for the development of competition at the time of the passage of the 1996 Act have not been realized.

Demonstrating that the local exchange is still a monopoly, and is likely to remain so for the foreseeable future, does not require an extensive *de novo* antitrust market analysis. The Commission concluded such an analysis just over a year ago when it approved the Bell Atlantic-NYNEX merger with conditions.[20] In that Order, the Commission concluded that in New York City LATA 132, arguably the market where local competition is the most developed:

> neither the firms remaining in the market nor other telecommunications firms not currently in the market appear able to quickly and effectively increase their presence in response to any exercise of market power in the relevant market.[21]

Unfortunately, the commitments made by Bell Atlantic in exchange for approval of the merger have not changed this conclusion. As the extensive documentation in the ALTS Petition shows, CLECs are still having difficulty buying essential network elements at

[20] In the Applications of NYNEX Corporation and Bell Atlantic Corporation for Consent to transfer control of NYNEX Corporation and its Subsidiaries, File No. NSD-L-96-10, Memorandum Opinion and Order, released August 14, 1997 ("BA/NYNEX Order")

[21] BA/NYNEX Order, para. 134.

reasonable prices.[22] As a result, the ILECs retain substantial market share and monopoly control over the local exchange. As demonstrated later, the source of the monopoly power is just as significant for broadband as for narrowband services.

1. Structure, Conduct and Performance

The state of local exchange competition can be evaluated with the assistance of the traditional Industrial Organization tool of structure, conduct and performance analysis.[23] The CLECs are growing rapidly as a result of substantial investments in broadband technology. However, today, CLECs primarily provide services for large businesses and IXCs in mostly business sections of large cities. Efforts to expand into residential markets are being thwarted by ILEC pricing and discrimination. As a result, CLEC progress can be stated in terms of markets or cities served. CLEC market penetration can also be usefully measured on a building-by-building basis. In 1997, CLECs had only 15,667 buildings located on their networks, representing less than 0.31 percent of commercial buildings, and less than 0.012 percent of households and commercial buildings.[24]

Merrill Lynch recently reported that they expect CLEC revenue share to reach five percent by the end of this year. However, their share of lines is expected to be less

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[22] See ALTS Petition.

[23] F.M. Scherer and David Ross, Industrial Market Structure and Economic Performance (1990). The U.S. Department of Justice Merger Guidelines are based on this paradigm. Contemporary economic analysis uses game theory to assess competitiveness in markets. See, e.g., Drew Fundenberg and Jean Tirole, Game Theory, Massachusetts Institute of Technology, 1991.A game theoretic approach to competition in local markets would not lead to a different conclusion.

[24] CLEC building data represent data provided to MCI from CLECs, and represent buildings that take less than 30 days to provision. ILEC housing estimates based on U.S. Bureau of the Census, Estimates of Housing Units and Households of States: April 1, 1990 and July 1, 1996, Table 1 (ST-96-20T). ILEC commercial building information based on US Energy Information Administration, Department of Energy,

than three percent.[25] The percentage of residential and small business customer revenues and lines served by competitors is, of course, even smaller. That number likely rounds to zero percent. In terms of total national market penetration, the CLECs are today approximately where the competitive long distance providers were in 1978. They are providing some dedicated services and are only in the early stages of providing switched services.[26] However, like IXCs in 1978, the potential of CLECs is unlimited, as long as rules are put into place that allow non-discriminatory access to customers.

Viewing the market from the perspective of conduct and performance confirms that the monopoly structure leads to monopoly results. Unlike customers and suppliers in competitive markets, access providers and their long distance customers frequently find themselves in adversarial relationships. For example, ILECs seldom cooperate with their CLEC or IXC customers when requests are made for new or more efficient forms of interconnection.[27] If the ILECs were facing imminent widespread facilities-based competition, they would be more than willing to make unbundled network elements available to firms that would otherwise construct competing facilities.

ILEC profits dramatically exceed any reasonable estimate of a competitive cost of capital. The most recently prescribed interstate rate of return was 11.25 percent. A study

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Commercial Buildings Characteristics, 1995, Table 3. The 1995 household and commercial building numbers were increased by 10 percent, to represent a conservative estimate of growth since 1995.

[25] See Daniel Reingold, et al, CLECs: What's Really Going On? June 19, 1998, p. 19. These numbers were calculated prior to the Merril Lynch September 9, 1998 report, which revises ILEC share upwards to reflect the mix of hi-cap and POTS lines being demanded in the current market environment.

[26] Section IV below discusses the experience with long distance competition.

[27] ALTS Petition.

completed in 1996 shows that the appropriate return then was less than 10 percent.[28] Interest rates have declined dramatically since that time. Recent reports filed with the Commission show that the price cap carriers are earning 15.52 percent.[29]

The ILECs might argue that this performance is due to the fact that price caps provide incentives for cost reductions. It is true that price caps are a contributing factor to the enormous returns. But other factors that may be just as significant as, or more significant than, price caps contribute to the excessive ILEC returns. For instance, access demand is growing due to the access charge reductions the Commission has imposed in the past, and due to competition in the long distance market. Costs are falling due to advances in switching and transmission technology that are affecting all high-technology companies. In short, productivity adjustments under price cap regimes are insufficient to prevent the inexorable climb of profits towards full unconstrained monopoly levels. In the BA/NYNEX Merger Order, the Commission noted that there are several reasons why price caps might not restrain market power, including mergers, bundling and degradation of quality.[30]

In a competitive market, there would be pressure to reduce access charges when profits are as high as those being experienced by ILECs. If competitive firms experienced such decreases in costs and increases in demand, they too might see dramatic

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[28] See "Statement of Matthew I. Kahal Concerning Cost of Capital," In the Matter of Rate of Return Prescription for Local Exchange Carriers, File No. AAD95-172, March 11, 1996.

[29] See April 14, 1998 ex parte letter from Mary Brown to Mr. Richard Metzger, Chief Common Carrier Bureau. Filed in CC Docket 94-1, In the Matter of Price Cap Performance Review for Local Exchange Carriers.

[30] See BA/NYNEX Merger Order, footnote 202.

increases in profitability, but such levels of profit would be transitory. They would quickly be competed away.

2. Competitive Technologies

The conclusion that ILECs retain monopoly control over the local exchange is also consistent with an analysis of competitive technologies by HAI. In The Enduring Local Bottleneck II ("ELB II"), HAI analyzed the business case for Cable and Wireless competition for residential and small business customers.[31] ELB II concluded that "neither cable nor wireless operators are likely to engage in widespread deployment of the competitive technologies."[32] ELB II analyzed the business case for providing cable telephony over hybrid fiber coax ("HFC") networks. There have been no changes in technology or costs sufficiently dramatic to change the results of that analysis. Cable companies have been attempting since the beginning of the 1990s to provide telephony over the HFC with virtually no penetration of the residential and small business marketplace.[33]

ELB II noted the potential development of cable modem service as an entry point for cable provision of telephony services. Developments with Internet voice technology

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[31] http://www.hainc.com

[32] Hatfield Associates, Inc, The Enduring Local Bottleneck II, April 30, 1997, p. 3. Robert W. Crandall and Leonard Waverman disagree with the ELB II predictions. They correctly point out that penetration is a key driver of profitability. A major source of disagreement is apparently the fact that cable operators in the United Kingdom are attracting 20 percent of their subscribers to telephone service. See Talk Is Cheap, 1995, p. 259. Of course, 20 percent of their customers amounts to substantially less than a twenty percent market share, particularly since cable service in the UK is not as popular as in the US. Moreover, telephone service pricing and quality is much different in the UK than in the US. See ELB II, pp. 41-42. In any event, time has produced the best evidence of the accuracy of the two predictions. According to the ILECs, "competition is still just right around the corner." With each passing year it becomes more evident that we are walking along a long block.

[33] Through participation in the CLEC business, cable companies have made some progress in the large business segment of the market.

and the recent announcement of the acquisition of TCI by AT&T provide some hope that this technology will help break the bottleneck. However, billions of dollars in investment and a substantial amount of time are required to fully implement this strategy. Wireless competition presents similar problems. Fixed wireless solutions may well provide competition for local exchange service in rural areas. However, as ELB II showed, the traffic loads imposed by fixed service make wireless technology impractical as a substitute for local exchange service in more densely populated areas. Broadband wireless is even more unlikely to emerge as a serious contender for fixed wireline service in the foreseeable future.

3. Broadband Competition

The ILECs argue that because they do not supply substantial amounts of broadband services today using xDSL technology, they have no market power over these services.[34] The problem, however, is that the ILECs do have market power over the facilities that would be used to provide broadband services. At a minimum, these facilities include the following:

- The copper wire loops, which the currently most promising broadband access technology, xDSL, utilizes;
- The Serving Area Interfaces ("SAIs") and Digital Loop Carrier ("DLC") remote terminal sites and associated rights-of-ways that are strategically positioned close to customers;
- The central offices, with their associated transmission equipment, main frames, powering, and the like;
- Local interoffice routes and fiber cables, and
- Operations Support Systems ("OSS") that are used to provision, monitor, and maintain loop and interoffice cable, and central office equipment.

[34] They obviously have a dominant position in providing traditional T1 and DS-3 broadband services.

Another significant characteristic of ILEC networks is their ubiquity. The ILECs are, by definition, collocated in every central office, and all of those central offices are connected with one another. The investment required to duplicate these facilities to serve small business and residential customers would, of course, be enormous. Thus, the ILECs control the essential facilities over which broadband services will be provided. They can use this control to discriminate against competitive broadband suppliers. Without appropriate regulation, the end result could be monopolization of broadband services and the extension of the bottleneck to the next generation of local exchange technology.

There are myriad ways in which ILEC control over facilities used for both traditional local and new broadband services could be used to disadvantage their broadband competitors. Subsidization of broadband facilities will be particularly easy if they are provisioned jointly with traditional local services. Technical and operational discrimination will also be possible, whether or not a separate subsidiary is in place. For example, with changing technology, the ILECs could design and provision broadband services designed to take unique advantage of the evolving capabilities of the local network.[35] New operations support systems and other operations technology, if preferentially applied to facilities used to provide ILEC services, but not to those used for competitors' services, can lead to differentiation in the quality of services. These problems are discussed in more detail in Section C. below.

[35] See B. Douglas Bernheim and Robert D. Willig, The Scope of Competition in Telecommunications, American Enterprise Institute (October, 1996), Chapter 4.

The ILECs could have argued in the 1980s that because they did not have a strong position in the fiber ring business being developed by companies such as MFS and Teleport, their own fiber ring services should be deregulated. However, using their existing local infrastructure as a springboard, an advantage no CLEC could have, the ILECs financed an enormous expansion in fiber capacity, which has allowed them to retain their dominant market position, even for the local services purchased by large corporate customers.[36]

Custom Calling features provide another example. These are new services enabled by changes in technology. However, competition for these services does not exist because the ILECs control the infrastructure over which they are provided. In many cases, these services are deregulated and the ILECs are making very large profits providing them. The prices of these services exceed incremental cost by a large margin.

B. Competition Will Stimulate Broadband Innovation

The 1996 Act adopts competition as the preferred vehicle for delivering local services to customers. However, the ILEC 706 Petitions suggest that unregulated monopoly may be the better vehicle for introducing broadband services to consumers. Economists have long recognized the key role that dynamic efficiency plays in bringing benefits to consumers. There is a school of thought associated with the writing of Joseph Schumpeter, that in the long run an unregulated monopoly will perform better than a competitively structured industry, if the environment for innovation is better under

[36] The ILECs claim that CLECs are adding as many or more business lines as ILECs. While this is a testament to CLEC customer innovation and customer service, the fact remains that the embedded base of

monopoly.[37] In the extreme case, consumers are obviously better off with a service provided at monopoly prices than they would be if the service were not offered at all. In other words, the dynamic efficiency gains associated with innovation under monopoly may exceed the efficiency losses associated with monopoly pricing.

The argument in favor of unregulated monopoly is that innovation will be fostered if there are few government restrictions on the pricing and deployment decisions of the monopolist. The underlying logic is stated quite simply. The high returns possible in an unregulated environment provide an incentive for taking the risks associated with developing and deploying new technology. The corollary is that restrictions on the monopolist raise the cost of developing and deploying technology and thereby reduce the potential returns.

The Commission has correctly rejected the view that monopoly is preferable to competition for purposes of stimulating the deployment of broadband services. One basis for the Commission's decision to prefer competition over unregulated monopoly is a legal one. The Commission found that it does not have the flexibility under the 1996 Act to grant the ILECs' demands for total deregulation of broadband services so they can be provided in an unregulated monopoly environment.[38] There is also an important economic rationale for the Commission's decision. The conditions necessary for monopoly to provide a superior environment for broadband innovation simply do not

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business lines is firmly under the control of the ILECs. See , "The Business Line Migration Phenomenon," P. 7.

[37] See Joseph A. Schumpeter, Capitalism, Socialism and Democracy (1942).

[38] See Order/NPRM, paras. 69-79.

exist in this case. The Commission, and by implication consumers, do not have to choose between unregulated monopoly and a less dynamic competitive industry.

There are several reasons why competition provides the better environment for broadband innovation. With parallel paths of innovation and risk taking by numerous firms, more technologies are tested and more innovation results. This view is implicit in the Commission's decision to foster competition in the provision of broadband services. There are numerous theoretical and empirical economic studies that analyze the implications of market structure for innovation. A leading scholar in the economics of innovation has concluded that, on balance, competition is more likely than monopoly to promote innovation:

> Viewed in their entirety, the theory and evidence suggest a threshold concept of the most favorable climate for rapid technological change. A bit of monopoly power in the form of structural concentration is conducive to innovation, *particularly when advances in the relevant knowledge base occur slowly.* But very high concentration has a positive effect only in rare cases, and more often it is apt to retard progress by restricting the number of independent sources of initiative and by dampening firms' incentive to gain market position by accelerated R&D. Likewise, given the important role that technologically audacious newcomers play in making radical innovations, it seems important that barriers to entry be kept at modest levels. Schumpeter was right in asserting that perfect competition has no title to being established as the model of dynamic efficiency. But his less cautious followers were wrong when they implied that powerful monopolies and tightly knit cartels had any stronger claim to that title. What is needed for rapid technical progress is a subtle blend of competition and monopoly, with more emphasis in general on the former than the latter, *and with the role of monopolistic elements diminishing when rich technological opportunities exist.*[39]

[39] F.M Scherer and David Ross, Industrial Market Structure and Economic Performance, , p. 660. (emphasis supplied)

These rich technological opportunities obviously exist in the case of broadband innovation.

It is not necessary to base a decision about the best market structure to promote innovation on broad economic theory or empirical analysis of other industries. The present set of circumstances in telecommunications shows conclusively that competition will work best to bring the benefits of broadband innovation to consumers. First, ILECs are likely to take any necessary risks in deploying broadband technology in their networks because there is a proven demand for service. Second, to the extent ILECs believe that facilities-based competition is a real threat, even a long-run threat, they will be compelled to invest in broadband to prevent competitive inroads in their core business.[40]

Third, broadband capability will stimulate demand for local monopoly services. To the extent price cap regulation allows ILECs to retain additional profits, they can do so as efficiencies are realized through growth. Fourth, there are several stages in the overall technological change process. Invention and innovation precede deployment. There is already a technologically progressive, dynamic equipment industry working hard to innovate. The ILECs are merely being asked to deploy what is being invented. They do not have to fund all of the broadband development or take all of the associated risks themselves. Fifth, competitive telecommunications providers have an outstanding track record of innovating in telecommunications. Each of these points is discussed in detail in the Sections that follow.

1. There Is Proven Demand for Service

As discussed in Section II, the development of low-cost computing capability, along with the growth of the Internet, have stimulated a tremendous demand for broadband capability. As discussed in Section II, CLECs and long distance carriers are responding to this demand with substantial investments in broadband capacity. The fact that competitive firms are building broadband capacity is highly instructive. AT&T, MCI Worldcom, Qwest, Level3, and the members of ALTS are risking billions of investor dollars in broadband technology. Therefore, the market is providing the Commission with information about broadband investment. These firms, all of whom lack market power, are willing to take the risk of broadband investment even though they face significant competition. Therefore, the ILECs, with their inherent advantages of sunk network investments and monopoly control over facilities serving small business and residential customers, should be willing to take investment risks without resorting to regulatory extortion.

This is not a case where the ILECs are being asked to make investments in anticipation of uncertain demand for services, which would be inherently risky. As Merril Lynch points out:

[40] On September 23, 1998, SBC Communications announced an initiative with Dell Computer and others to market ADSL. See http://www.dell.com/corporate/media/newsreleases, viewed September 23, 1998.

> (a) without fanfare, the ILECs are among those materially benefiting from the explosion of web sites and Internet users; and (b) the local telephone industry should no longer be viewed as a slow-growing industry, inextricably tied to household formation and employment levels.[41]

If the ILECs build the broadband network, the customers will come.[42]

2. ILECs Must Innovate to Respond to Competitive Forces

As discussed in Section IV.A., the local market is not yet competitive. Nevertheless, there is still optimism that some competition will develop. The ILECs, for their part, claim that competition is either already rampant or "right around the corner." If the ILECs believe their own rhetoric, they will deploy broadband even if the services are regulated simply because others will if they do not. Even if they do not believe their own competition rhetoric, their profit maximizing strategy is to invest in broadband, to both meet customer demand and to prepare for whatever competition does develop. CLECs have the ability to serve larger customers in urban areas with their own facilities. CLECs such as COVAD have demonstrated an ability to deploy broadband to customers using unbundled ILEC loops. Cable companies are deploying cable modems, and AT&T has plans to accelerate that process. LMDS and broadband satellite are potential alternatives. These embryonic efforts are not yet sufficient to discipline pricing in the local exchange market. They are, however, sufficient to provide an incentive for ILECs to engage in broadband innovation.

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[39] See Merril Lynch, Telephone Services – Local, p. 1.

[42] The Crandall/Jackson paper provides a great deal of analysis of demand for broadband services. Eliminating Barriers to DSL Service. The study confirms that demand for broadband service is robust. However, Crandall and Jackson conclude that the business case for ILEC deployment of these services would be impacted negatively by regulation. Section IV.D. below demonstrates that the Commission's rules for pricing of unbundled services provide incentives for deploying technology.